Forward jet resolution study Aug 2, fsPHENIX biweekly meeting

- **Issues in last update**
  - Add more events generated with min parton pT (pTHatMin) lower than before (5.0)
  - Check resolutions from 510 GeV events as well

- **In this report**
  - Sanity check: spread of reco_e / true_e vs. true_e
  - Notable configurations

    a. only Pythia8 results

    b. added more events generated with lower min parton pT (3, 4)

    c. varied parameters: beam energy and Anti-kT radius

    d. selected leading jets using pT of reconstructed jets + min pT cut

Procedures and Conditions

- **Procedures:**

  1. Generate events using Pythia8 (Pythia6) + Geant4 simulation + Jet evaluator

     (used default setup in *Fun4All_G4_fsPHENIX.C*, framework build pulled in July 21)

  2. Evaluate truth jets, then search 1st/2nd leading jets (highest/2nd highest p_T) in an event

     * min pT of the Pythia setting (pTHatMin) applied as min pT cut during leading jet selections

  3. Fill target parameter (ex. e_reco/e_true) for given condition (below) into a TH1

  4. Get resolution of the target parameter using Gaussian fit + min # of entries cut (> 50)

- **Conditions**

  – Pythia8 only

  – Beam energy (√s) = 200 or 510

  – Total # of events generated: 0.5 M (0.1 M per each min parton pT setup (3, 4, 5, 10, and 15)) per each beam energy

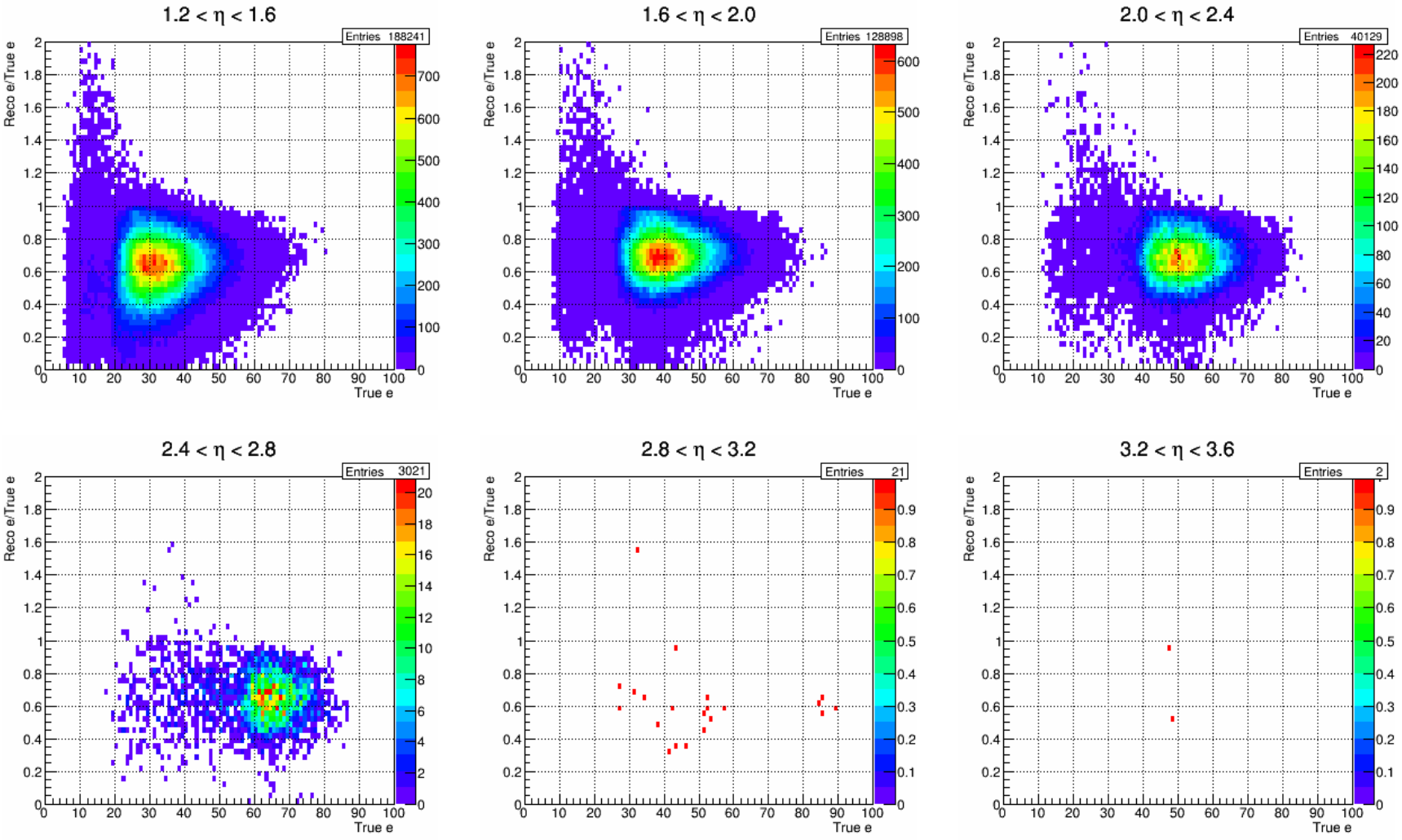
  – Used truth jet (reconstructed based on particle level, NOT tower)

  – Anti-kT radii: 0.4 and 0.6

  – True η windows: {1.2, 1.6, 2.0, 2.4, 2.8, 3.2, 3.6, ~~4.0~~}

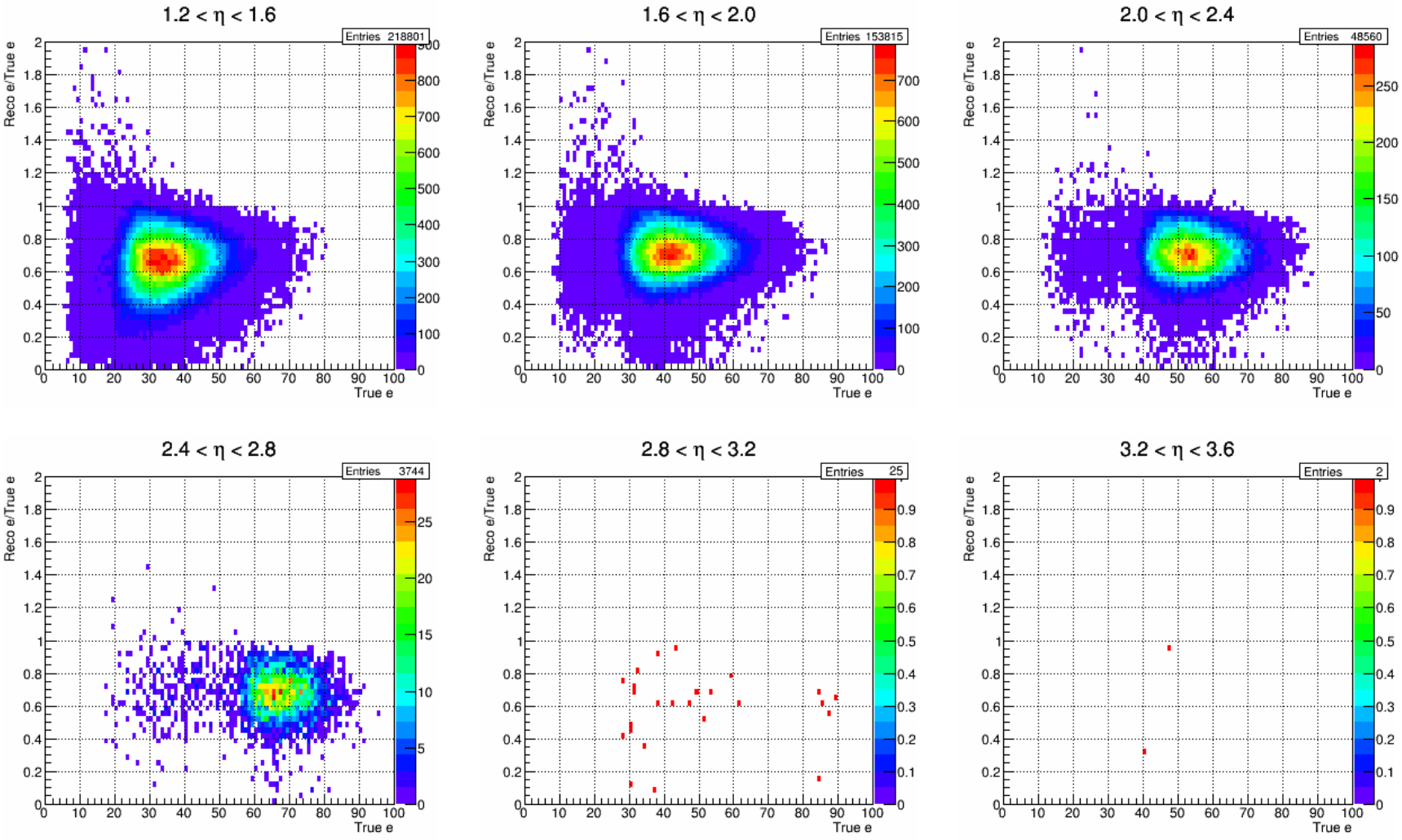
  – True energy windows: {20,25,30,35,40,45,50, 60,70,80,90,100,110,120,130,140,150,160, 180,200}

Sanity checks $\sqrt{s}$ = 200 (GeV), Anti k_T R = 0.4



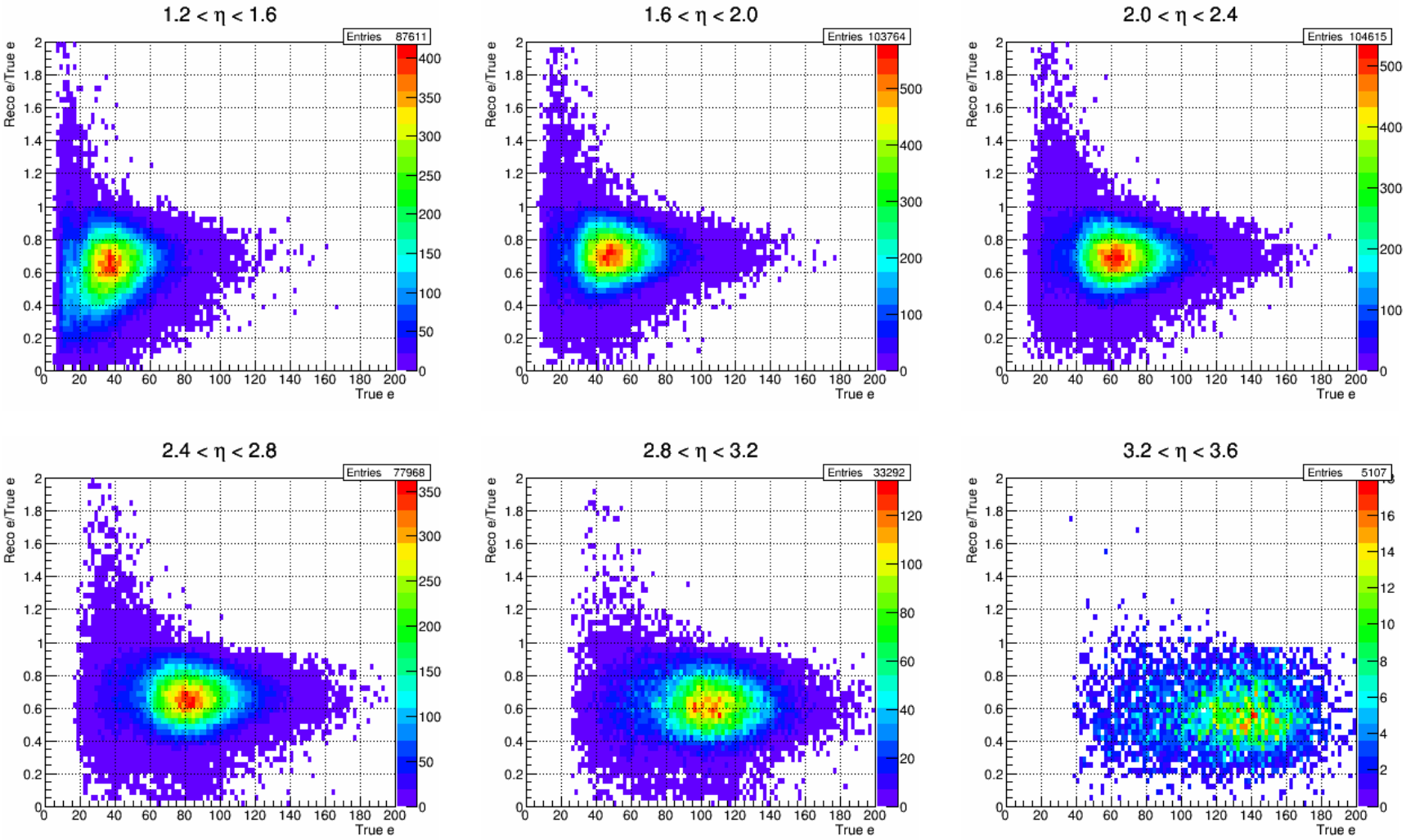
– Reco e / True e vs. True e, <u>0.5 M generated</u>, 1st/2nd leading jets by p_T only

Sanity checks $\sqrt{s}$ = 200 (GeV), Anti k_T R = 0.6



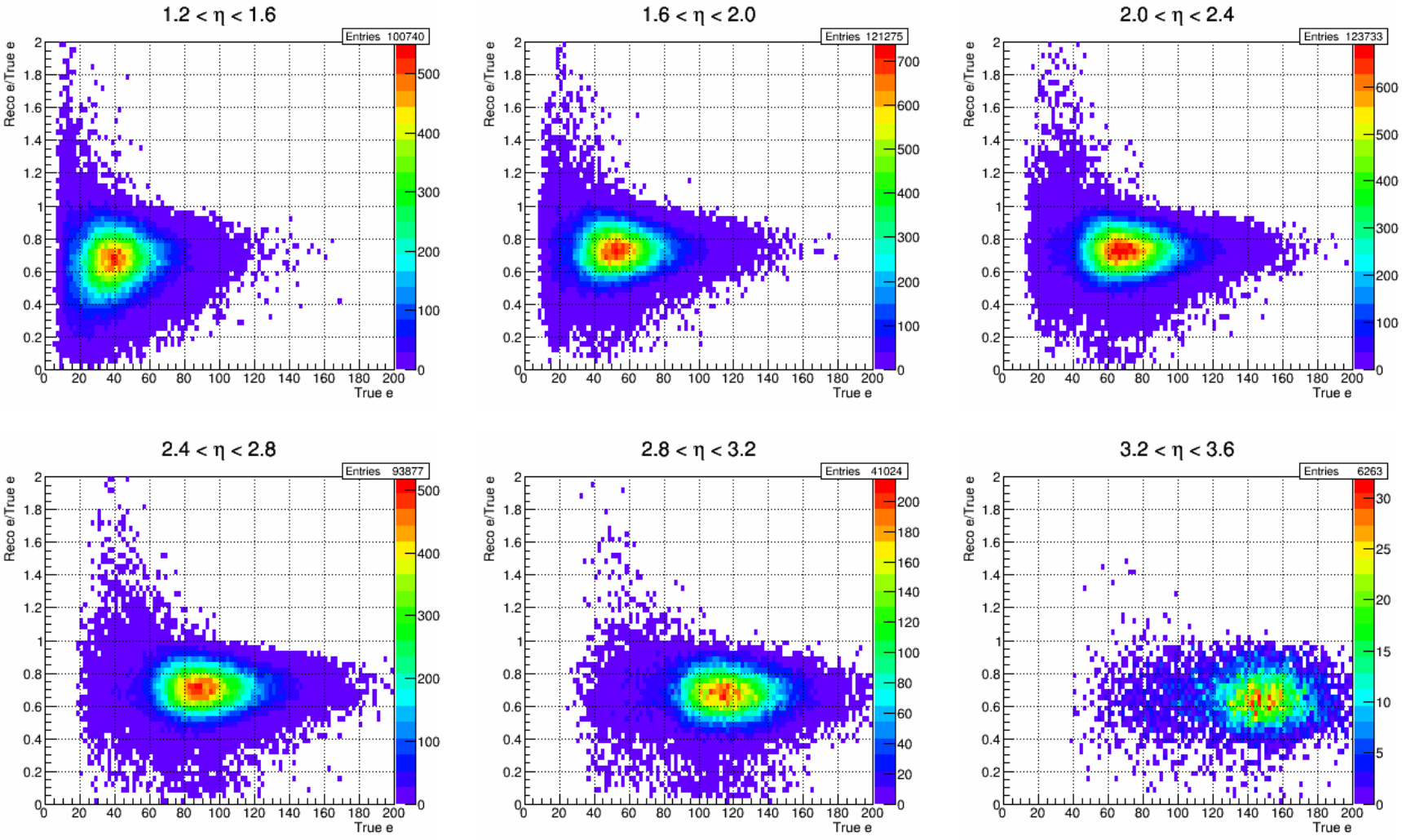
– Reco e / True e vs. True e, <u>0.5 M generated</u>, 1st/2nd leading jets by p_T only

Sanity checks $\sqrt{s}$ = 510 (GeV), Anti k_T R = 0.4



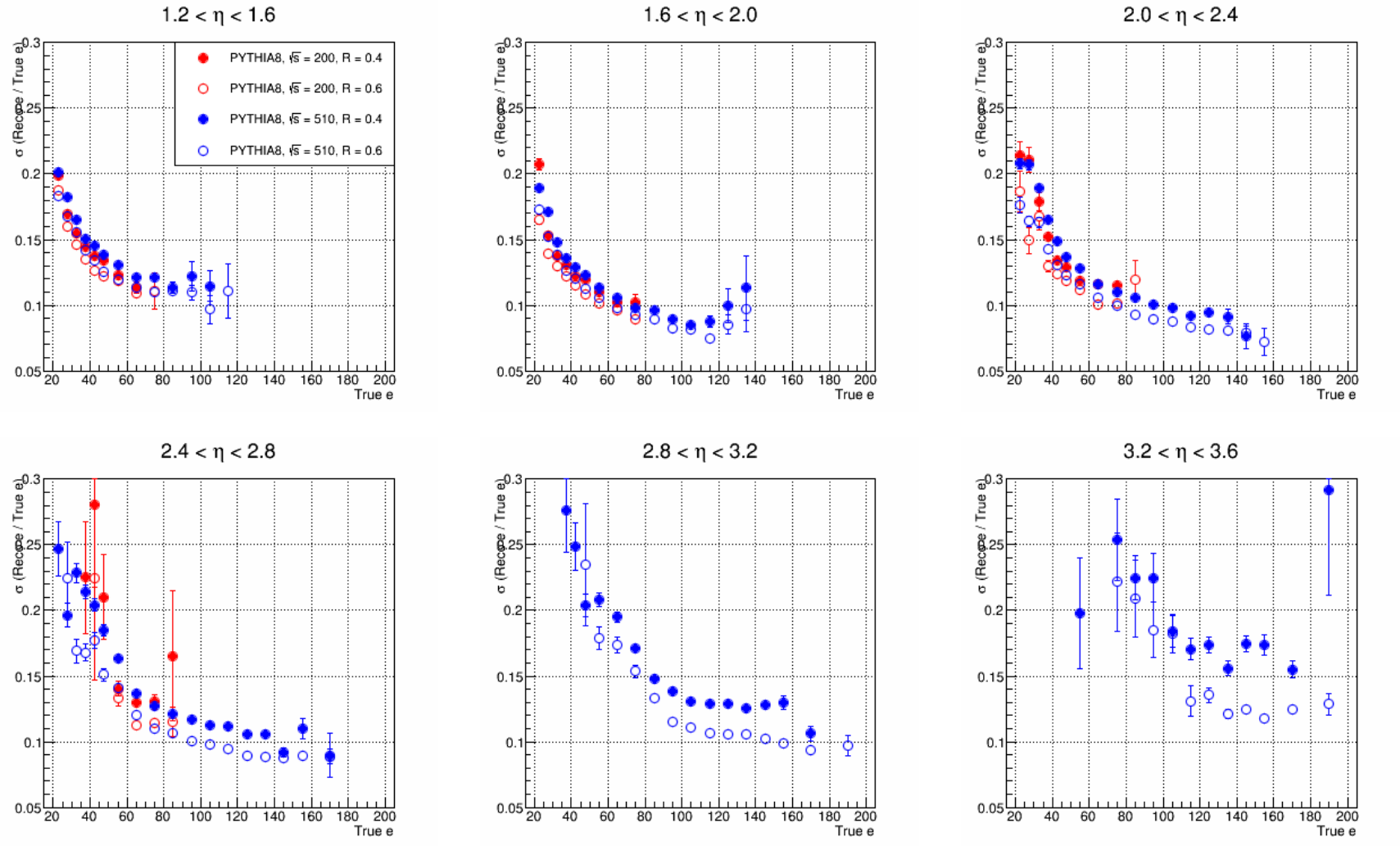
– Reco e / True e vs. True e, <u>0.5 M generated</u>, 1st/2nd leading jets by p_T only

Sanity checks $\sqrt{s}$ = 510 (GeV), Anti k_T R = 0.6



– Reco e / True e vs. True e, <u>0.5 M generated</u>, 1st/2nd leading jets by p_T only

Resolution Spread of reco_e/true_e vs. true_e



Summary

- **Tested sanity of current study using pythia8 + reco_e/true_e**
  - $\eta > 2.8$ for $\sqrt{s} = 200$ (GeV) still almost empty:

    → need to add more events with pTHatMin < 3
  - Large discrepancy in $\sqrt{s} = 510$ GeV for R = 0.4 and R = 0.6

    → is this expected feature?

- **To do**
  - Add more low pTHatMin events to $\sqrt{s} = 200$
  - Produce actual resolution plots
  - Need to work with pythia6 (no progress yet)

Backup sPHENIX proposal

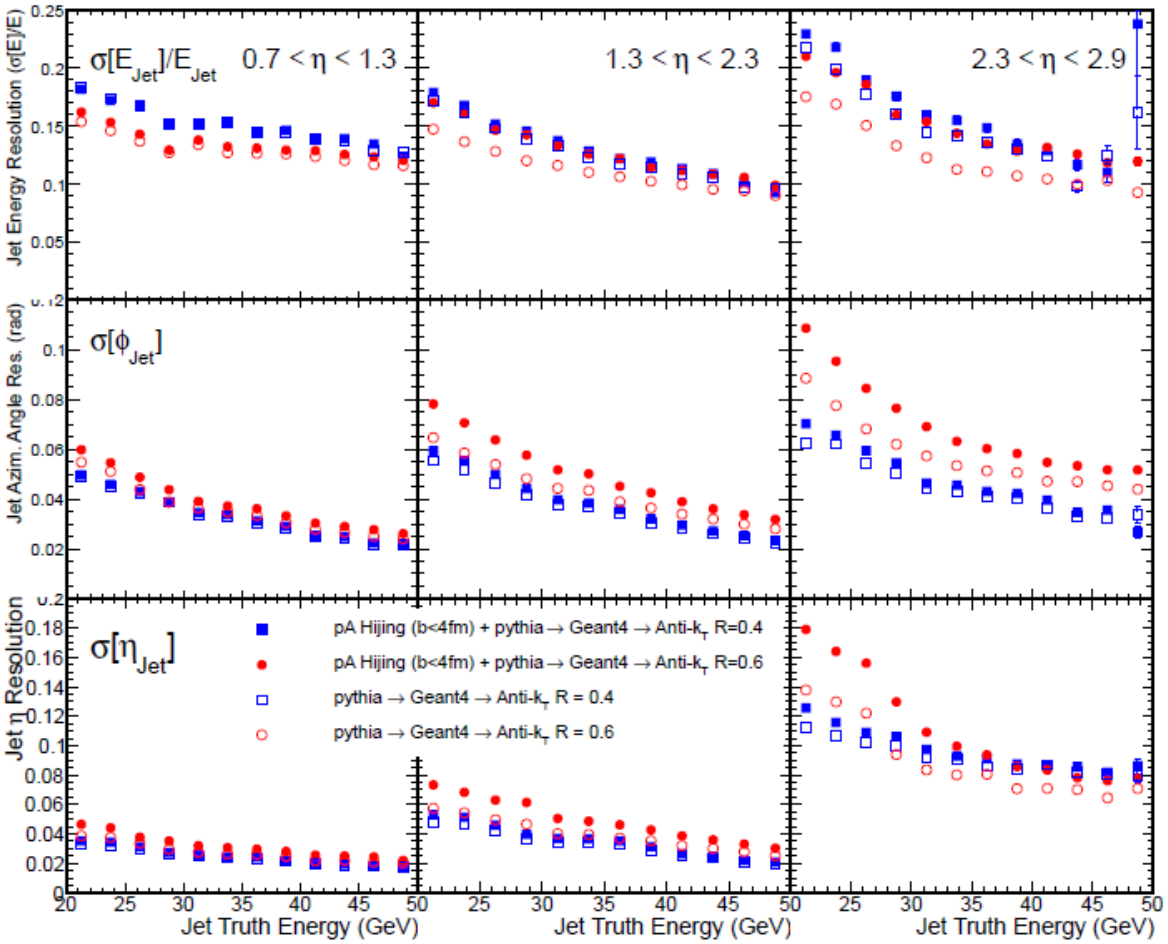
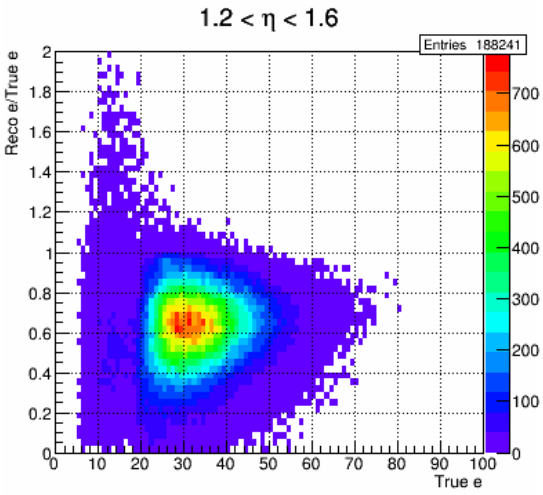
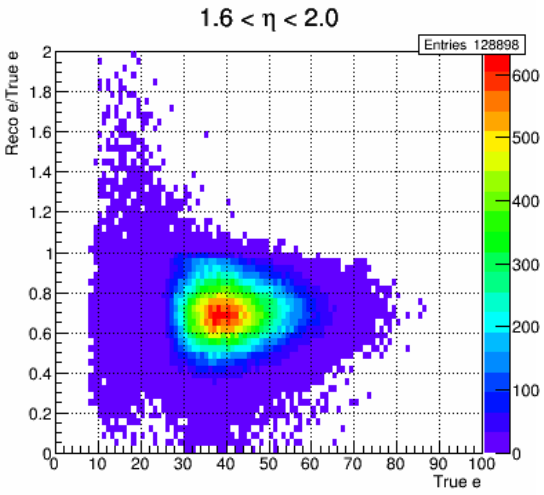
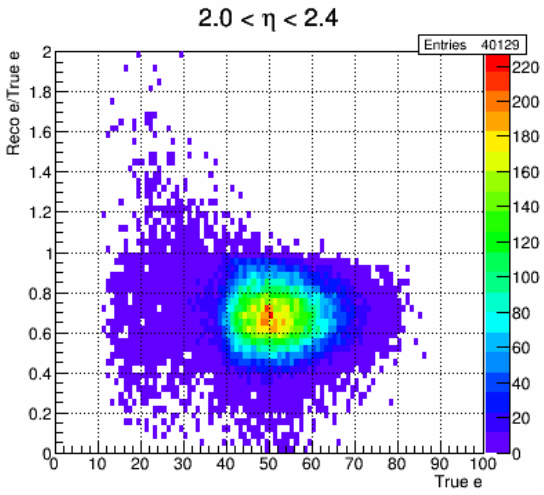


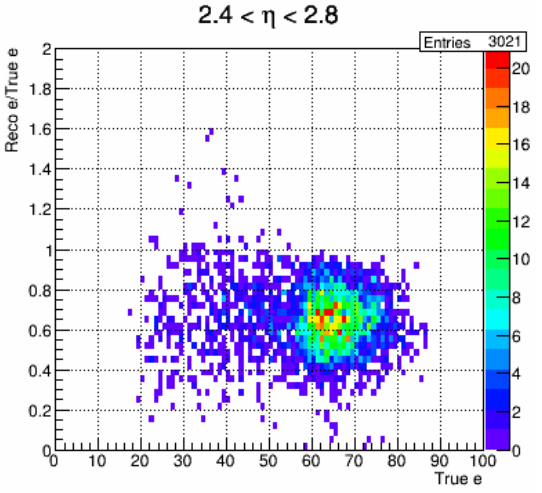
Figure A.2: The GEANT4 simulated jet resolution of single jets for energy (top row), ϕ (middle row) and η (bottom row) in $p+p$ (open markers) and $p+A$ (closed markers) collisions reconstructed with the FASTJET anti-k_T algorithm with $R = 0.4$ (blue) and $R = 0.6$ (red).

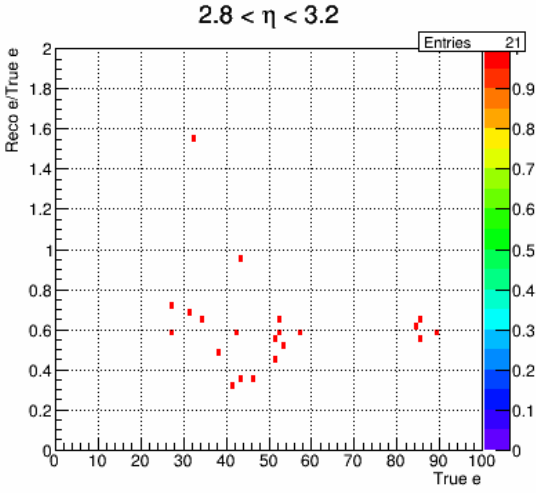
Backup sanity check, 200, 0.4, leading jets selected by energy

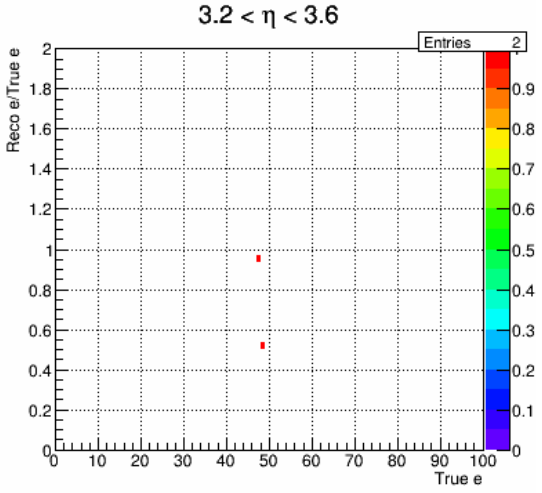




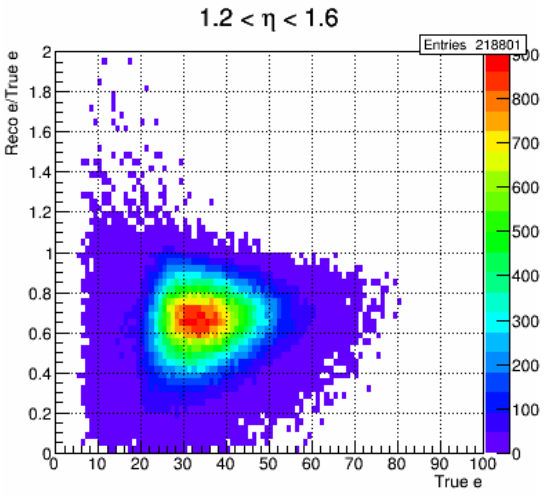


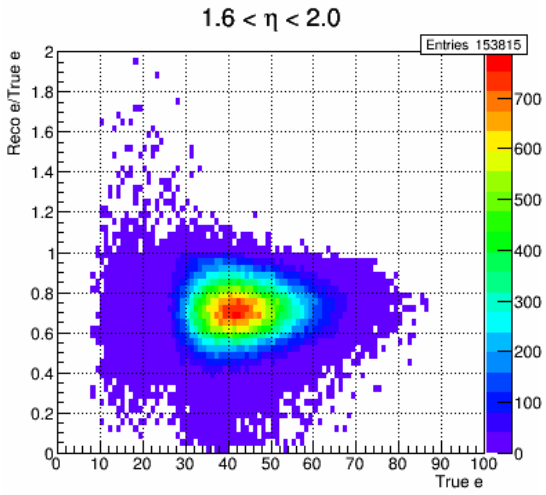


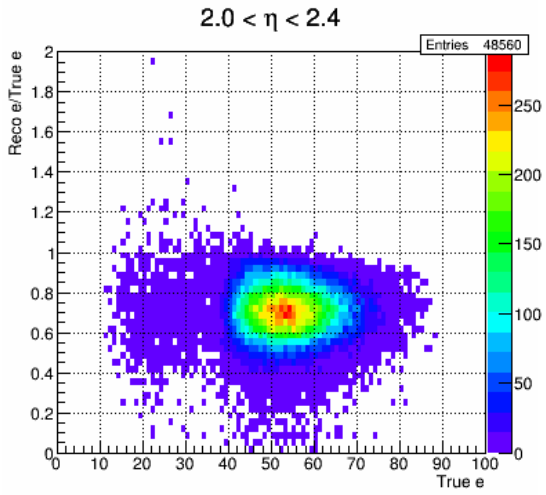


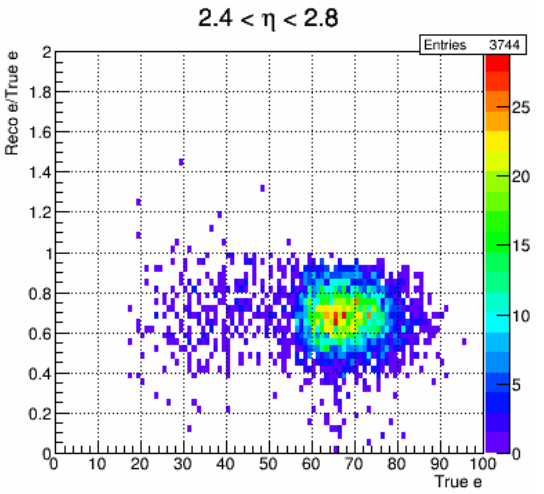


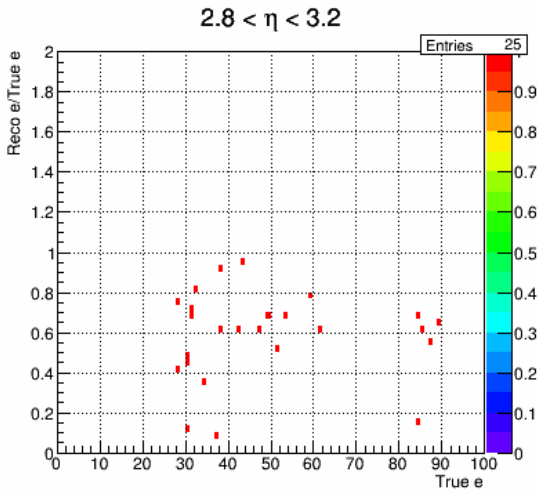
Backup sanity check, 200, 0.6, leading jets selected by energy

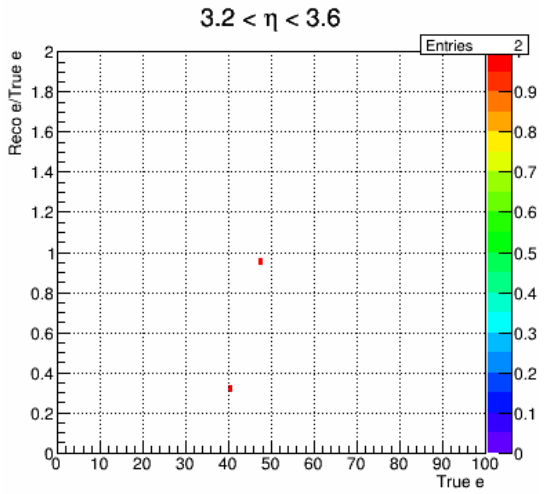




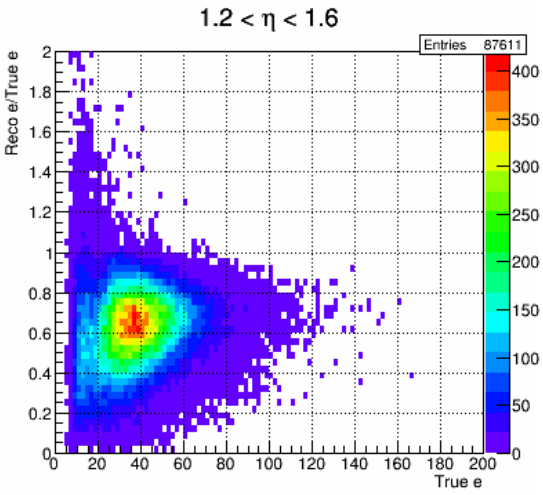


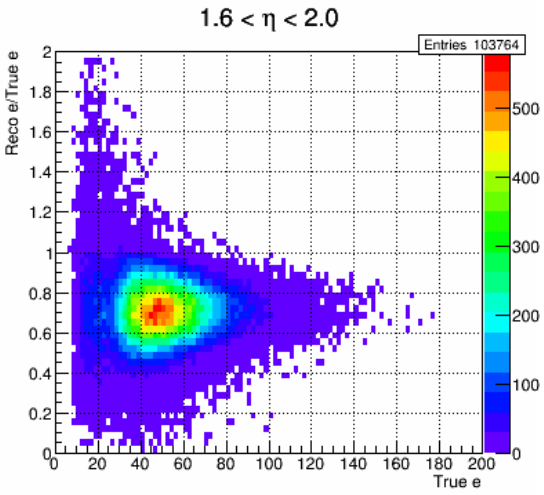


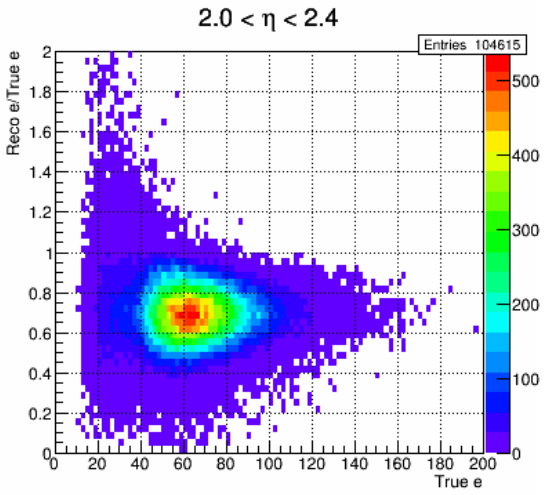


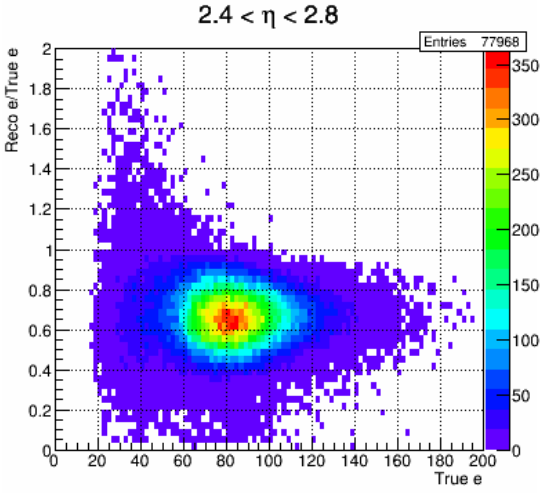


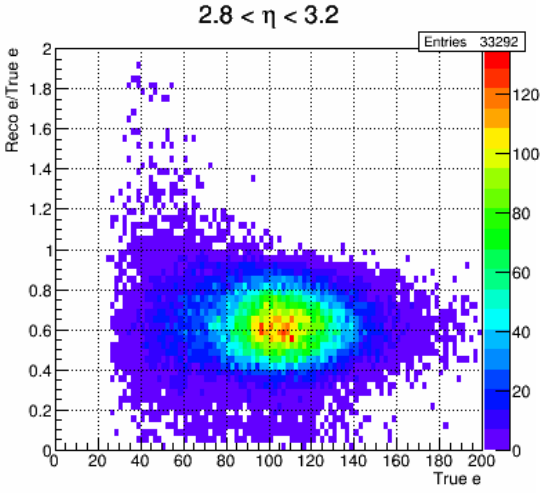
Backup sanity check, 510, 0.4, leading jets selected by energy

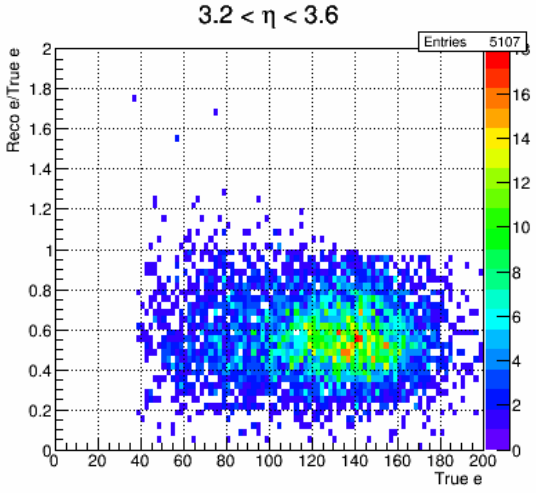




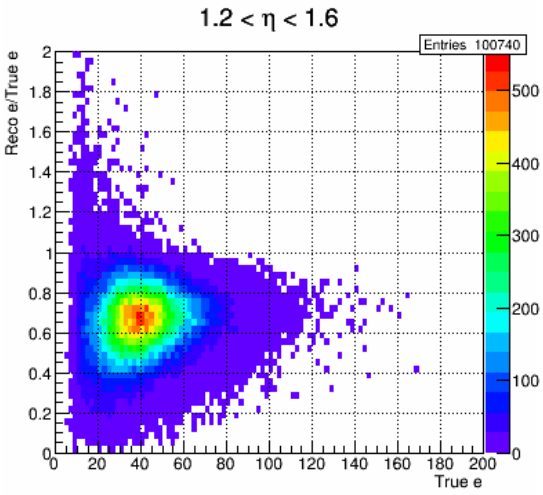


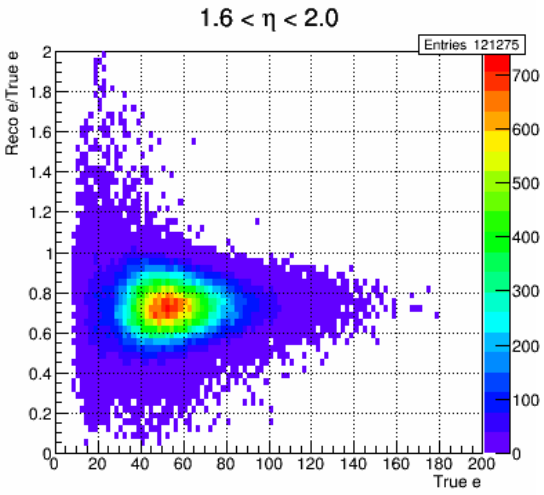


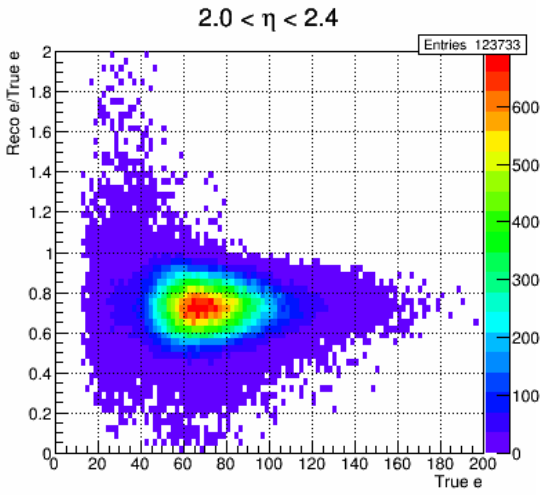


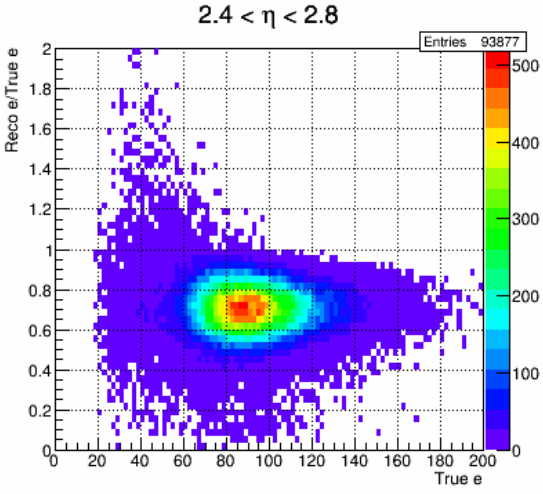


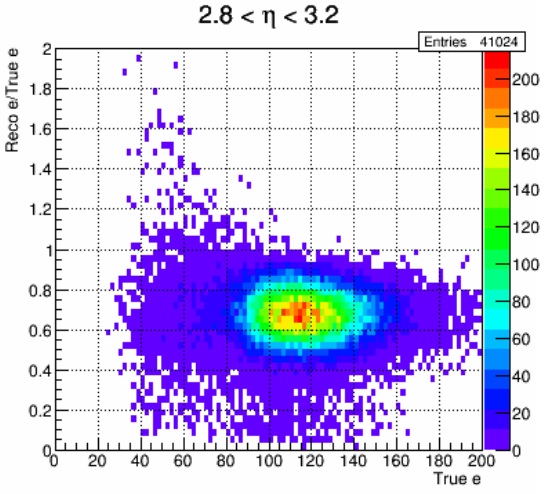
Backup sanity check, 510, 0.6, leading jets selected by energy

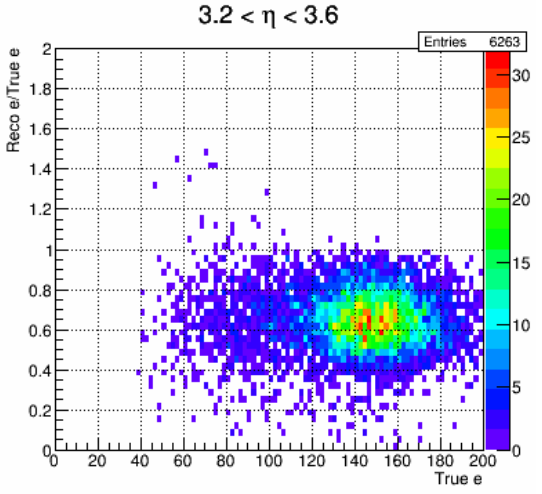












Backup resolution, leading jets selected by energy